

IN THE CLAIMS:

Please AMEND claims 18 and 28, and ADD new claims 29-34, as follows. For the Examiner's convenience, all claims currently pending in this application have been reproduced below:

1-10. (Cancelled)

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β1 11. (Withdrawn) A semiconductor device manufacturing method comprising the steps of:

installing manufacturing apparatuses comprising an optical system having a plurality of spaces and a mechanism that fills each of the spaces with a gas, a gas contained at least in one of the plurality of spaces has a refractive index different from that of a gas contained at least in one of the remaining spaces, and a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces; and

manufacturing a semiconductor device in a plurality of processes by using the manufacturing apparatuses.

12. (Withdrawn) The method according to claim 11, further comprising the steps of

connecting the manufacturing apparatuses by a local area network, and

communicating information about at least one of the manufacturing apparatuses between the local area network and an external network of the semiconductor manufacturing factory.

13. (Withdrawn) The method according to claim 12, wherein maintenance information of the manufacturing apparatus is acquired by data communication by accessing a database provided by a vendor or user of the exposure apparatus via the external network, or production is managed by data communication via the external network with a semiconductor manufacturing factory other than the semiconductor manufacturing factory.

14. (Withdrawn) A semiconductor manufacturing factory comprising:

$\beta 1$  manufacturing apparatuses for various processes, including an exposure apparatus comprising an optical system having a plurality of spaces and a mechanism that fills each of the spaces with a gas, a gas contained at least in one of the plurality of spaces has a refractive index different from that of a gas contained at least in one of the remaining spaces, and a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces;

a local area network for connecting said manufacturing apparatuses; and

a gateway for allowing the local area network to access an external network of said factory,

wherein information about at least one of said manufacturing apparatuses is communicated by connection to the external network.

15. (Withdrawn) A maintenance method for an exposure apparatus installed in a semiconductor manufacturing factory and comprising an optical system having a plurality of spaces and a mechanism that fills each of the spaces with a gas, a gas contained at least in one of

the plurality of spaces has a refractive index different from that of a gas contained at least in one of the remaining spaces, and a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces, comprising the steps of:

causing a vendor or user of the exposure apparatus to provide a maintenance database connected to an external network of the semiconductor manufacturing factory;

authenticating access from the semiconductor manufacturing factory to the maintenance database via the external network; and

transmitting maintenance information accumulated in the maintenance database to the semiconductor manufacturing factory via the external network.

16. (Withdrawn) An exposure apparatus comprising an optical system having a plurality of spaces and a mechanism that fills each of the spaces with a gas, a gas contained at least in one of the plurality of spaces has a refractive index different from that of a gas contained at least in one of the remaining spaces, and a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces, comprising:

a display;

a network interface; and

a computer for executing network software,

wherein maintenance information to the exposure apparatus is communicated via a computer network.

17. (Withdrawn) The apparatus according to claim 16, wherein the network software is connected to an external network of a factory where the exposure apparatus is installed, provides on said display a user interface for accessing a maintenance database provided by a vendor or user of the exposure apparatus, and enables obtaining information from the database via the external network.

18. (Currently Amended) An exposure apparatus comprising:

*B1*  
a first space a projection optical system for projecting a pattern formed on a mask, onto an object to be exposed, which has a plurality of optical elements, wherein said projection optical system has a first space enclosed with two optical elements of the plurality of optical elements and filled with a helium gas; gas, and a second space enclosed with two optical elements of the plurality of optical elements and filled with a nitrogen gas,

wherein a pressure of the first space is higher than that of the second space.

19. (Previously Presented) The apparatus according to claim 18, wherein the first and second spaces are adjacent to each other.

20. (Previously Presented) The apparatus according to claim 19, wherein the first and second spaces are adjacent to each other via an optical element.

21. (Previously Presented) The apparatus according to claim 18, wherein the pressure difference between the first and second spaces is not more than 1,000 Pa.

22. (Previously Presented) The apparatus according to claim 18, further comprising:

a helium gas supply means for supplying the helium gas into the first space;

a first exhaust means for exhausting an internal gas of the first space;

a nitrogen gas supply means for supplying the nitrogen gas into the second space;

and

a second exhaust means for exhausting an internal gas of the second space.

23. (Previously Presented) The apparatus according to claim 18, further comprising a projection optical system for projecting exposure light from a pattern to an object to be exposed, wherein the first and second spaces are formed in the projection optical system.

24. (Previously Presented) The apparatus according to claim 18, wherein the first space is substantially closed except for an opening portion of the helium gas supply means and the first exhaust means.

25. (Previously Presented) The apparatus according to claim 24, further comprising:

a detection unit which detects the pressure of the first space; and

an operation unit which operates the pressure of the first space based on the detection result of the detection unit.

26. (Previously Presented) The apparatus according to claim 18, wherein the second space is substantially closed except for an opening portion of the nitrogen gas supply means and the second exhaust means.

27. (Previously Presented) The apparatus according to claim 26, further comprising:  
a detection unit which detects the pressure of the second space; and  
an operation unit which operates the pressure of the second space based on the detection result of the detection unit.

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28. (Currently Amended) A device manufacturing method comprising:  
exposing ~~the~~ an object by using ~~the~~ an exposure apparatus ~~according to claim 18~~  
which comprises a projection optical system for projecting a pattern formed on a mask, onto the  
object to be exposed, which has a plurality of optical elements, the projection optical system  
having a first space enclosed with two optical elements of the plurality of optical elements and  
filled with a helium gas and a second space enclosed with two optical elements of the plurality of  
optical elements and filled with a nitrogen gas, with a pressure of the first space being higher  
than that of the second space; and  
developing the exposed object.

29. (New) The apparatus according to claim 18, further comprising a support structure which supports the plurality of optical elements, wherein said first and second spaces are disposed inside the support structure.

30. (New) An exposure apparatus comprising:

a projection optical system for projecting a pattern formed on a mask, onto an object to be exposed, which has a plurality of optical elements;

a first space enclosed with two optical elements of the plurality of optical elements and filled with a helium gas;

a second space enclosed with two optical elements of the plurality of optical elements and filled with a nitrogen gas, wherein a pressure of the nitrogen gas in the second space is lower than that of the helium gas of the first space;

first supply means for supplying the helium gas to the first space;

first exhaust means for exhausting an atmosphere of the first space;

second supply means for supplying the nitrogen gas to the second space; and

second exhaust means for exhausting an atmosphere of the second space.

31. (New) The apparatus according to claim 30, further comprising a support structure which supports the plurality of optical elements, wherein said first and second spaces are disposed inside the support structure.

32. (New) A device manufacturing method comprising:

exposing an object by using an exposure apparatus which comprises a projection optical system for projecting a pattern formed on a mask, onto an object to be exposed, which has a plurality of optical elements, a first space enclosed with two optical elements of the plurality of optical elements and filled with a helium gas, a second space enclosed with two optical elements

of the plurality of optical elements and filled with a nitrogen gas, wherein a pressure of the nitrogen gas in the second space is lower than that of the helium gas of the first space, first supply means for supplying the helium gas to the first space, first exhaust means for exhausting an atmosphere of the first space, second supply means for supplying the nitrogen gas to the second space and second exhaust means for exhausting an atmosphere of the second space; and developing the exposed object.

33. (New) An exposure apparatus comprising:

an illumination optical system for illuminating a pattern formed on a mask by using a light source; and

B1 a projection optical system for projecting the pattern onto an object to be exposed, which has a plurality of optical elements, wherein said projection optical system has a first space enclosed with two optical elements of the plurality of optical elements and filled with a helium gas, and a second space enclosed with two optical elements of the plurality of optical elements and filled with a nitrogen gas, the first and second spaces being adjacent to each other, and a pressure of the first space being higher than that of the second space.

34. (New) A device manufacturing method comprising:

exposing an object by using an exposure apparatus which comprises an illumination optical system for illuminating a pattern formed on a mask by using a light source and a projection optical system for projecting the pattern onto the object to be exposed, which has a plurality of optical elements, the projection optical system having a first space enclosed



with two optical elements of the plurality of optical elements and filled with a helium gas and a second space enclosed with two optical elements of the plurality of optical elements and filled with a nitrogen gas, the first and second spaces being adjacent to each other and a pressure of the first space being higher than that of the second space; and

developing the exposed object.

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